ACCESSION #:

LICENSEE EVENT REPORT

FACILITY NAME: R.E. Ginna Nuclear Power Plant Page: 1 of 8

DOCKET NUMBER: 05000244

TITLE: LER 2002-001, Loss of "A" Condenser Circulating Water Pump Results in Manual Reactor Trip

EVENT DATE: 02-05-2002 LER #: 2002-001-00 REPORT DATE: 03-29-2002

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: John T. St.Martin - Nuclear Safety and Licensing
TELEPHONE: (716) 771-3641

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: KE COMPONENT: MO
MANUFACTURER: W120

REPORTABLE TO EPIX: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On February 5, 2002, at approximately 0911 EST, with the plant in Mode 1 at approximately 100% steady state reactor power, the "A" condenser circulating water pump tripped. The Control Room operators entered Abnormal Operating Procedure AP-CW.1 for loss of the circulating water pump. At approximately 0912 EST, following procedural direction, the reactor was manually tripped. The Control Room operators performed the appropriate actions of procedures E-0 and ES-0.1. Following the reactor trip, all safety systems operated as designed, and the reactor was stabilized in Mode 3.

The tripping of the "A" condenser circulating water pump was caused by the failure of a pump motor field wire. The circulating water pump motors are synchronous motors. When the wire

failed, motor field current was lost and the motor was tripped by its power factor relay protection. The field wire failure was preceded by the failure of a constant voltage transformer in the motor excitation circuit.

The cause of the reactor trip was manual operator action.

Corrective actions included replacing the excitation constant voltage transformer and the failed field wire, followed by electrical integrity testing of the motor/exciter.

Corrective action to prevent recurrence is outlined in Section V.B.

END OF ABSTRACT

I. PRE-EVENT PLANT CONDITIONS:

On February 5, 2002, at approximately 0911 EST, the plant was in Mode 1 at approximately 100% steady state reactor power with no significant activities in progress.

II. DESCRIPTION OF EVENT:

A. EVENT:

On February 5, 2002, at approximately 0911 EST, the plant was in Mode 1 at approximately 100% steady state reactor power with no significant activities in progress. The Control Room operators received Main Control Board (MCB) Annunciators G-8 (4KV Motor Overload) and J-16 (Motor Off CW-EH Emerg Oil Seal Oil BU), both caused by the trip of the "A" condenser circulating water (CW) pump. The trip of the "A" CW pump was followed by automatic closure of the discharge valve for the "A" CW pump. The Control Room operators promptly identified the loss of the "A" CW pump. They entered Abnormal Operating Procedure AP-CW.1 (Loss of a Circ Water Pump) and performed the appropriate actions.

Procedure AP-CW.1 provides direction for loss of a CW pump. In accordance with AP-CW.1, a manual reactor trip was ordered by the Control Room Foreman. The Control Room operators manually tripped the reactor at approximately 0912 EST and performed the appropriate actions of Emergency Operating Procedure E-0 (Reactor Trip or Safety Injection). They transitioned to Emergency Operating Procedure ES-0.1 (Reactor Trip Response) when it was verified that both reactor trip breakers were open, all control and shutdown rods were inserted, and safety injection was not actuated or required.

During the transient, levels in the "A" and "B" steam generators (SG) decreased

below the Lo Lo SG Level setpoint of 17%, which resulted in automatic start of both motor-driven auxiliary feedwater (AFW) pumps and the turbine-driven AFW pump. The Control Room operators verified that the AFW pumps started as per design on Lo Lo SG levels. The Control Room operators received MCB Annunciator K-3 (AMSAC Actuation) at approximately 0913 EST (due to 3/4 feedwater flow channels <25% as a result of automatic main feedwater isolation signal on decreasing reactor coolant system (RCS) temperature that occurs per design after a reactor trip) and verified that the turbine-driven AFW pump, which would automatically start due to a signal from the ATWS Mitigation System Actuation Circuitry (AMSAC), had already started due to Lo Lo SG levels in both SGs.

During the performance of ES-0.1, the Control Room operators noted that RCS cooldown was occurring. Per procedural direction, they manually stopped the turbine-driven AFW pump at approximately 0916 EST, and manually closed both main steam isolation valves (MSIV) at approximately 0932 EST. These procedurally-directed actions mitigated the RCS cooldown.

The plant was stabilized in Mode 3 at approximately 1022 EST, and the Control Room operators transitioned to normal operating procedures.

The Control Room operators subsequently notified higher supervision. The shift supervisor notified the NRC per 10 CFR 50.72 (b) (2) (iv) (B), non-emergency four hour notification, at approximately 1120 EST on February 5, 2002.

The "A" CW pump was restored to service at approximately 1300 EST on February 6, 2002, after replacement of the failed field wire and constant voltage transformer and electrical integrity testing of the motor and exciter circuitry.

B. INOPERABLE STRUCTURES, COMPONENTS, OR SYSTEMS THAT CONTRIBUTED TO THE EVENT:

None

C. DATES AND APPROXIMATE TIMES OF MAJOR OCCURRENCES:

- February 5, 2002, 0911 EST: "A" CW pump trips.
- February 5, 2002, 0912 EST: Control Room operators manually trip the reactor, verify both reactor trip breakers open, and verify all control and shutdown rods inserted. Event date and time.
- February 5, 2002, 0912 EST: Discovery date and time.
- February 5, 2002, 0912 EST: AFW pumps automatically start on Lo Lo SG levels.

- February 5, 2002, 0932 EST: Control Room operators manually close both MSIVs to limit RCS cooldown.
- February 5, 2000, 1022 EST: Plant is stabilized in Mode 3.

D. OTHER SYSTEMS OR SECONDARY FUNCTIONS AFFECTED:

None

E. METHOD OF DISCOVERY:

The trip of the "A" CW pump was immediately apparent to the Control Room operators due to MCB Annunciators G-8 and J-16 and MCB indicating lights for the "A" CW pump. The reactor trip was manually initiated and was confirmed by plant response, alarms, and indications in the Control Room.

F. SAFETY SYSTEM RESPONSES:

All safeguards equipment functioned properly. Both motor-driven AFW pumps started when SG level decreased below 17% after the reactor trip. The turbine-driven AFW pump started as per design, when SG levels in both SGs decreased below 17% after the reactor trip. This condition does not meet the definition for the NRC Performance Indicator (PI) "Safety System Functional Failures" because all safety systems functioned as designed.

III. CAUSE OF EVENT:

A. IMMEDIATE CAUSE:

The immediate cause of the reactor trip was manual trip initiation, ordered by the Control Room Foreman as directed by procedure AP-CW.1 in response to loss of the "A" CW pump.

B. INTERMEDIATE CAUSE:

The intermediate cause of the loss of the "A" CW pump was actuation of the power factor relay protection, due to a loss of pump motor field.

C. ROOT CAUSE:

The underlying cause of the power factor trip of the "A" CW pump was the failure

of a motor field wire. The CW pump motors are synchronous motors. The synchronous motor field current for the "A" CW pump was lost, resulting in motor power factor falling below the relay setpoint. The field wire failure was preceded by the failure of a SOLA constant voltage transformer (CVT) in the motor exciter field supply circuit. The CVT output failed high, increasing the exciter output current to the motor field but still within motor ratings. The apparent root cause for the failed wire is degraded wire strands caused by cyclic movement of the wire during motor operation. This event is NUREG-1022 Cause Code (B), "Design, Manufacturing, Construction / Installation".

IV. ASSESSMENT OF THE SAFETY CONSEQUENCES OF THE EVENT:

This event is reportable in accordance with 10 CFR 50.73, Licensee Event Report System, item (a) (2) (iv) (A), which requires a report of, "Any event or condition that resulted in a manual or automatic actuation of any of the systems listed in paragraph (a) (2) (iv) (B) of this section". The manual reactor trip is an actuation of the reactor protection system, and AFW pump starts are actuations of a PWR auxiliary feedwater system.

An assessment was performed considering both the safety consequences and implications of this event with the following results and conclusions:

There were no operational or safety consequences or implications attributed to the trip of the "A" CW pump and subsequent manual reactor trip because:

- The two reactor trip breakers opened as required.
- All control and shutdown rods inserted as designed.
- The plant was stabilized in Mode 3.
- The Ginna Updated Final Safety Analysis Report (UFSAR) was reviewed. This transient is bounded by a total loss of external electrical load accident. Results of the analyses show that the plant design is such that a total loss of external electrical load without a direct or immediate reactor trip presents no hazard to the integrity of the reactor coolant system or the main steam system. Pressure-relieving devices incorporated in the two systems are adequate to limit the maximum pressures within the design limits. The integrity of the core is maintained by operation of the reactor trip system; i.e., the DNBR is maintained above the limit value. This UFSAR transient was examined and compared to the plant response for the actual event. The plant behavior was found to be consistent with, and bounded by, the event detailed in the accident analysis.

- The Ginna Improved Technical Specifications (ITS) Limiting Conditions for Operation (LCOs) and Surveillance Requirements (SRs) were reviewed with respect to the post trip review data. The following are the results of that review:

  - Pressurizer (PRZR) pressure decreased below 2205 PSIG during the transient after the reactor trip. During this time the plant was in Mode 3, where ITS LCO 3.4.1 is no longer applicable. Therefore, compliance with ITS was maintained. Additional mitigation was provided by stopping the turbine-driven AFW pump and closing the MSIVs. Minimum PRZR pressure was approximately 2084 PSIG, and PRZR pressure was restored > 2205 PSIG within approximately nine (9) minutes.

  - After the reactor trip, the RCS cooled down to approximately 531 degrees F and was subsequently stabilized at 547 degrees F. The cooldown was within the limits of ITS LCO 3.4.3. In addition, the required shutdown margin was maintained at all times during the RCS cooldown.

  - After the reactor trip, levels in both the "A" and "B" SGs decreased below 16%. During this time the plant was in Mode 3, where compliance with ITS LCO 3.4.5 is required. An operable RCS loop consists of an operable reactor coolant pump and an operable SG, which has the minimum water level of 16%. During the time when the level in a SG was < 16%, the SG was considered inoperable. For approximately three (3) minutes, the plant was in ITS CONDITION 3.4.5.C, with both RCS loops inoperable. Minimum SG level was approximately 3%. The REQUIRED ACTION for CONDITION 3.4.5.C was performed, and SG levels in both SGs were restored above 16% by approximately 0915 EST.

Based on the above and the review of post trip data and past plant transients, it can be concluded that the plant operated as designed, that there were no unreviewed safety questions, and that the public's health and safety was assured at all times.

V. CORRECTIVE ACTIONS:

A. ACTION TAKEN TO RETURN AFFECTED SYSTEMS TO PRE-EVENT NORMAL STATUS:

- The Control Room operators performed the appropriate actions of Abnormal Operating Procedure AP-CW.1 and Emergency Operating Procedures E-0 and ES-0.1, and the plant was stabilized in Mode 3.

- The SOLA CVT for the "A" CW pump was replaced.
- The "A" CW pump motor field wires were replaced in the area of the failure.
- The power factor protective relay for the "A" CW pump motor was inspected and tested satisfactorily.
- The "A" CW exciter and motor were tested for electrical integrity and found satisfactory.
- The "B" CW pump motor and exciter were inspected for field wire condition, tested for electrical integrity and found satisfactory. (The "B" CW pump CVT had been previously replaced in October 2000.)

B. ACTION TAKEN OR PLANNED TO PREVENT RECURRENCE:

NOTE: There are no NRC regulatory commitments in this Licensee Event Report.

- Both CW motor excitation CVTs have been placed on a 10 year replacement cycle.
- The "A" CW motor and exciter will be refurbished during the 2002 refueling outage. This will include replacement of the exciter output cables and motor field cables up to the field windings.
- The "B" CW motor and exciter will be refurbished during the 2003 refueling outage.
- Alternative, more reliable DC current supply and control options for the CW exciters will be evaluated.

VI. ADDITIONAL INFORMATION:

A. FAILED COMPONENTS:

The "A" CW pump motor is a Westinghouse "Life Line" series motor, S.O. # 110P662H01, frame size HR-111-SPL, rated for 4000 volts and 1750 horsepower.

The CVT is a constant voltage sinusoidal CVT, catalog number 33-16-210, serial number 8G10, rated for 1000 VA (volt-amps), and is manufactured by SOLA.

B. PREVIOUS LERs ON SIMILAR EVENTS:

An historical search of LERs was conducted with the following results: No documentation of similar LER events with the same root cause could be identified. However,

- LER 95-008 was a similar event (loss of CW pump, resulting in a manual reactor trip) with a different root cause for the loss of the CW pump. The corrective action to prevent recurrence would not have prevented LER 2002-001.

- LER 96-002 was a similar event (loss of CW pump, resulting in a manual reactor trip) with a different root cause for the loss of the CW pump. The corrective action to prevent recurrence would not have prevented LER 2002-001.

- LER 2000-005 was a similar event (loss of CW pump, resulting in a manual reactor trip) with a different root cause for the loss of the CW pump. The corrective action to prevent recurrence would not have prevented LER 2002-001.

- Recent reactor trips with different root causes are LER 1999-007, LER 1999-008, and LER 2000-001.

C. THE ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIS) COMPONENT FUNCTION IDENTIFIER AND SYSTEM NAME OF EACH COMPONENT OR SYSTEM REFERRED TO IN THIS LER:

COMPONENT	IEEE 803 FUNCTION	IEEE 805 SYSTEM IDENTIFICATION
circulating water pump	P	KE
circulating water pump motor	MO	KE
auxiliary feedwater pump	P	BA
reactor coolant pump	P	AB
pressurizer	PZR	AB
main steam isolation valve	ISV	SB
steam generator	SG	SB
circ water pump motor exciter	EXC	KE
circ water pump motor CVT	XFMR	KE

D. SPECIAL COMMENTS:

None

RG AND E

ROCHESTER GAS AND ELECTRIC CORPORATION
89 EAST AVENUE
ROCHESTER, NY 14649-0001
AREA CODE 716-546-2700

ROBERT C. MECREDY
Vice President, Nuclear Operations

March 29, 2002

U.S. Nuclear Regulatory Commission
Document Control Desk
Attn: Robert L. Clark
Project Directorate I
Washington, D.C. 20555

Subject: LER 2002-001, Loss of "A" Condenser Circulating Water Pump Results in Manual Reactor Trip
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Clark:

The attached Licensee Event Report LER 2002-001 is submitted in accordance with 10 CFR 50.73, Licensee Event Report System, item (a) (2) (iv) (A).

Very truly yours,
/s/

Robert C. Mecredy

xc: Mr. Robert L. Clark (Mail Stop O-8-C2A)
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

U.S. NRC Ginna Senior Resident Inspector

*** END OF DOCUMENT ***